

AMENDMENTS

Please cancel claims 2-4 and 10 without disclaimer or prejudice.

Please amend claims 1, 7 and 11 as follows (a marked-up copy of the amendments follows):

1. A process for the catalytic conversion of at least one reactant in a thermal chemical reaction, excluding deep oxidation, comprising:

passing at least one reactant into at least one reaction chamber;

A1 said reaction chamber comprising a catalyst that catalyzes the reaction of said at least one reactant;

transferring heat to or from said at least one reaction chamber into at least one heat exchanger; and

obtaining at least one product from said reaction chamber;

wherein said step of transferring heat, at steady state, transfers at least 0.6 W/cc of total reactor volume, where total reactor volume is defined as the sum of the volume of the reaction chamber(s) and heat exchanger chamber(s) including the volume of chamber walls;

wherein a contact time of the reactant with the catalyst is less than about 0.3 seconds; and

wherein a pressure drop through the reaction chamber is less than about 15 psig.

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7. A process for the catalytic conversion of at least one reactant in a thermal chemical reaction, excluding deep oxidation, comprising:

passing at least one reactant into at least one reaction chamber;

said reaction chamber comprising a porous catalyst that catalyzes the reaction of said at least one reactant;

transferring heat to or from said at least one reaction chamber from or into at least one heat exchanger; and

obtaining at least one product from said reaction chamber;

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wherein said porous catalyst comprises a metal support; and
wherein a contact time of the reactant is less than about 0.3 seconds, thereby
suppressing slow reactions and the formation of at least one undesirable chemical reaction
product.

29. A method for suppressing formation of at least one undesirable chemical
reaction product in a thermal chemical reaction, comprising:

passing at least one reactant into at least one reaction chamber;

said reaction chamber comprising a porous catalyst that catalyzes the
reaction of said at least one reactant;

transferring heat to or from said at least one
reaction chamber from or into at least one heat exchanger; and

obtaining at least one product from said reaction chamber;

wherein said porous catalyst comprises a metal support; and

comprising at least one of the following process steps:

at steady-state, transferring at least 0.6 W of heat per cc of total reactor
volume, such that, at steady state, the catalyst is maintained within a temperature range
that reduces the formation of at least one undesirable chemical reaction product; or

maintaining a contact time of the reactant at less than about 0.3 seconds,
thereby suppressing slow reactions and reducing the formation of at least one undesirable
chemical reaction products.

Please add new claims 13-46 as follows:

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13. The process of claim 1 wherein the at least one product obtained from said
reaction chamber is fed to another reaction chamber containing a different catalyst.

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14. The process of claim 1 wherein the catalyst comprises an interfacial layer on a
porous support.

41.
15. The process of claim 14 wherein said at least one reaction chamber comprises a series of different catalysts disposed within the same reaction chamber.

42.
16. The process of claim 14 wherein the interfacial layer has a BET surface area of at least 1 m²/g.

43.
17. The process of claim 14 wherein a catalytically active material is deposited on the interfacial layer.

4.
18. The process of claim 1 wherein said step of transferring heat, at steady state, transfers at least about 1.0 W/cc of total reactor volume.

7.
19. The process of claim 1 wherein said step of transferring heat, at steady state, transfers between 5 and 250 W/cc.

5.
20. The process of claim 18 wherein a wall of the reaction chamber through which heat is exchanged comprises microchannels.

8.
21. The process of claim 1 wherein said step of transferring heat, at steady rate, transfers between 10 and 100 W/cc.

22. The process of claim 1 wherein the contact time is less than 0.1 seconds.

23. The process of claim 18 wherein the contact time is less than 0.05 seconds.

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24. The process of claim 14 wherein the contact time is less than 0.01 seconds.

6.
25. The process of claim 18 wherein the pressure drop is less than 10 psig.

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9.
~~26.~~ The process of claim 1 wherein the pressure drop is less than 5 psig.

44.
~~27.~~ The process of claim ~~17~~⁴³ wherein the pressure drop is less than 1 psig.

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[~~28.~~ The process of claim 6 wherein the catalyst comprises an interfacial layer on a porous support, and a thermal coefficient of expansion of the porous support is different from a thermal coefficient of the interfacial layer.

48.
~~29.~~ The process of claim ~~28~~⁴⁷ wherein a catalytically active material is deposited on the interfacial layer.

50.
~~30.~~ The process of claim ~~28~~⁴⁷ wherein said step of transferring heat, at steady state, transfers at least 1.0 W/cc of total reactor volume.

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49.
~~31.~~ The process of claim ~~29~~⁴⁸ wherein said step of transferring heat, at steady state, transfers between 5 and 250 W/cc.

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[~~32.~~ The process of claim 6 wherein said step of transferring heat, at steady rate, transfers between about 10 and about 100 W/cc.

~~33.~~ The process of claim 7 wherein the catalyst comprises an interfacial layer on a porous support, and a thermal coefficient of expansion of the porous support is different from a thermal coefficient of the interfacial layer.

57.
~~34.~~ The process of claim ~~33~~⁵⁶ wherein a catalytically active material is deposited on the interfacial layer.

58.
~~35.~~ The process of claim ~~33~~⁵⁶ wherein the contact time is less than 0.1 seconds.

~~36~~²⁸. The process of claim ~~7~~³⁰, wherein the contact time is less than 0.05 seconds.

~~37~~⁵⁹. The process of claim ~~33~~⁵⁶, wherein the contact time is less than 0.01 seconds.

~~38~~³¹. The process of claim ~~11~~²⁹ wherein the catalyst comprises an interfacial layer on a porous support, and a thermal coefficient of expansion of the porous support is different from a thermal coefficient of the interfacial layer.

~~39~~³³. The process of claim ~~38~~³¹ wherein a catalyst material is deposited on the interfacial layer.

~~40~~³⁴. The process of claim ~~38~~³¹ wherein said step of transferring heat, at steady state, transfers at least about 1.0 W/cc of total reactor volume.

~~41~~³³. The process of claim ~~39~~³² wherein said step of transferring heat, at steady state, transfers between 5 and 250 W/cc.

~~42~~³⁵. The process of claim ~~40~~³⁴, wherein said step of transferring heat, at steady rate, transfers between 10 and 100 W/cc.

~~43~~³⁶. The process of claim ~~40~~³⁴, wherein the contact time is less than 0.1 seconds.

~~44~~³⁷. The process of claim ~~11~~²⁹, wherein the contact time is less than 0.05 seconds.

~~45~~³⁸. The process of claim ~~39~~²⁹, wherein the contact time is less than 0.01 seconds.

~~46~~³⁸. The process of claim ~~11~~²⁹ wherein said thermal chemical reaction is the water-gas shift reaction, wherein an undesirable product is methane.